RACER System History

The U.S. Air Force under the technical direction of HQ AFCESA and HQ USAF/ILEVR developed *RACER*. The system uses a patented methodology to generate parametric cost estimates. *RACER* cost models are based on generic engineering solutions for environmental projects, technologies, and processes. These engineering solutions are based on data from government and industry, construction management agencies, technology vendors, and contractors, as well as historical project information. The system can be used to estimate costs for Studies, (PA/SI, RI/FS and RFI/CMS), Remedial Design, Remedial Action, Operations and Maintenance, Site Work and Utilities.

RACER development began in the spring of 1991, and was originally intended to be a three phased development effort (additional phases were added over time). Efforts during the first phase were focused on development of a working prototype. A *RACER* users group was established to review and evaluate the prototype as it was developed. Several versions of the prototype were released during the development process**.** The first phase of development culminated in the spring of 1992 with the release of *RACER* Version 1.0, which contained 22 cost models and operated on a DOS platform. The cost models represented individual technologies and construction activities that a system user groups together to form a complete site remediation process.

The second phase of development included enhancement and expansion of several Phase 1 models, as well as development of additional cost models. Also included were user training and cost estimating support. The second phase of development continued through 1992 and included the releases of versions 1.25 and 1.50. More than 300 users had been trained and registered by the end of 1992. Phase 2 concluded in the fall of 1993 with the release of *RACER* Version 2.0. Version 2.0 contained over 70 cost models as well as several system enhancements. Among the most notable enhancements were templates for user defined professional labor rates and user defined analysis rates. Version 2.0 marked the end of development under the DOS platform.

The third phase of development began in the fall of 1993 with the conversion of the entire *RACER* system to a Windows platform. Thirteen new cost models were also developed. The first Windows version of *RACER*, Version 3.0, was released in the fall of 1994. The Windows platform facilitated development of a more intuitive user interface. In addition to being the first Windows version of *RACER*, Version 3.0 also contained a departure from prior releases in the overall operating assumptions. Version 3.0 contained parametric cost models for Remedial Action Professional Labor, Contractor General Conditions, and Overhead and Profit. These models facilitated development of detailed estimates for project costs that were vague and difficult to ascertain in previous versions. Version 3.0 also contained a user defined estimate capability that enabled users to develop their own quantity take off estimates using the *RACER*

cost database as a foundation. This feature also allowed users to build their own cost assemblies. By the end of 1994, almost 1,000 *RACER* users had been registered and trained.

Through most of FY 1994, *RACER* development had been funded almost entirely by the Air Force. However, by late 1994, other government agencies began to take more than just an interest in *RACER* development. The Department of Interior, Office of Environmental Policy and Compliance was the first outside DOD agency to fund the development of a *RACER* model, the Air Sparged Hydrocyclone Model. They were also the first federal agency to fully adopt the *RACER* software as their restoration cost estimating system. In the summer of 1995, the US EPA Office of Underground Storage Tanks and HQ/ILEVR jointly funded the development of a customized version of *RACER* specifically tailored to remediation activities associated with small petroleum storage tank sites. The customized version, known as Tank *RACER*, was released in the Spring of 1996. Enhancements in Tank *RACER* included a series of pre-defined treatment train templates as well as a feature enabling users to develop their own treatment train templates. Also included in Tank *RACER* were templates for professional labor tasks and UST specific analytical protocol templates. A new version of *Tank RACER*, called *Tank RACER 99*, was developed and released in January 1999.

1996 marked the fifth year of *RACER* development, with over 1,300 users trained. That year's release, called Version 3.2, was released July 1996 and contained approximately 100 cost models and several system enhancements. It included all modifications and enhancements and upgrades currently in Tank *RACER* and three new cost models: the DOI-funded Air Sparged Hydrocyclone model, the Air Force Armstrong Laboratory, Environics Directorate-funded a Permeable Barriers model, and the EPA-funded Petroleum UST Site Assessment.

Additional model development occurred after the release of Version 3.2, for inclusion in a future release of the system. HQUSACE funded the development of six models related to unexploded ordnance cleanup. The Department of Energy funded the development of two models related to facility decontamination and decommissioning. The Air Force also funded the development of 3 new models for Bioslurping, Composting, and Permitting. The DOI funded a Passive Water Treatment model and another model to clean up abandoned mine sites.

In April 1997, a Technical Users Workgroup, featuring users from Government, Industry and the contractor community, was convened to review the system. The majority of comments focused on the need to: (1) update the technologies in the system due to changes in technology design and application, (2) modify the system's Work Breakdown Structure to be compliant with the new ICEG (now EC2 – Environmental Cost Engineering Committee) WBS, and (3) update the functionality of the system to a new architecture, including the graphical user interface and interfaces with other project management systems.

RACER 99 Release

Based on the committee's recommendations, a new set of enhancements was prioritized for inclusion in the next system release. That release occurred in December 1998 and was called *RACER 99*. The enhancements were partially Air Force-funded, and partially self-funded by the system contractor as a benefit to the Government of the commercial license (see Section 4.1.4). All self-funded enhancements were reviewed by the Government prior to their inclusion. The enhancements included:

- Technical enhancements for over 50 existing models
- Additions of 2 new models (natural attenuation and passive water treatment) and 5 mini-models (drilling, excavation, trenching, pumps and blowers)
- Capability to report to the Updated Federal Government Interagency Work Breakdown Structure, to the 3rd level
- New "preferences" capability that allow the user to customize the system for unique business, regulatory and cost requirements
- Increased O&M details using a new approach that generates an O&M cost distribution for the treatment train over the O&M duration
- Numerous system enhancements, including conversion to VB/Access from Cobol and full conversion to Windows 95/NT
- New five-level system hierarchy
- Cost database update incorporating the new Commercial Unit Price Book and the ECHOS 99 HTRW data
- New Remedial Action treatment train wizards

Progress on these enhancements was reviewed three separate times in 1998. In April 1998, another Technical User Workgroup, featuring users from Government, Industry and the contractor community, was convened to review the system. The review focused on the following elements of the new system release:

- System phases and levels
- System setup and preferences
- Wizards concept
- O&M concept and methodology
- System user interface
- Model prioritization
- New help system
- Technology model changes
- Markups and remedial design methodology
- Studies methodology

- Remedial action professional labor methodology

In addition to the review provided in April 1998, the U.S. Army Corps of Engineers – HTRW CX and the HQ Air Force Center for Environmental Excellence provided independent technical reviews of system components in the Summer of 1998. The review included the following: chemical library, soil library, drilling mini model, RA wizard logic, RA professional labor percentages, major model rebuilds, natural attenuation model, new cost assemblies from ECHOS 98, price survey update, and the new help system.

Finally, a Federal Government review group assembled in September 1998 to review the system functionality and interface by using the Tank *RACER* 98 beta system. This group included individuals from HQ AFCESA/CESC, HQ AFCEE/ER, ACC, AETC, Tyndall AFB, USACE- HTRW CX, NAVFAC, NEESA, EPA, and DOE. Applicable comments from this review and all other reviews were incorporated into the system design.

The *RACER* 99 version was released in December 1998. This version of *RACER* had approximately 500 government and government contractor users and 550 total users. Government users include the Departments of Defense, Energy, and Interior, the Environmental Protection Agency, Academic Institutions, and government contractors.

RACER 2000 Release

The *RACER* 2000 release occurred in several phases – the first release in December 1999, and a subsequent release in June 2000. Enhancements contained in *RACER* 2000 included: Importing/exporting; secondary media/waste contaminant; copying and pasting technologies; new reporting features; new remedial design features; parameter passing; viewing line items; 13 new *RACER 2000* models; and an independent government estimate pricing capability.

RACER 2001 Release

The RACER 2001 software was released in October of 2001. The following is a list of enhancements included in the release: Updated RACER Database; Choice of Cost Tables to Use; Importing/Exporting Information; New Comment Field; Auto Update Project Costs (Prior Year Costs); Ability to See Date of Database; Phytoremediation Technology; Update of 11 existing RACER technologies; New Professional Management Percentage Template; Reporting; New Cost Summary Report (folder level); and the new Markup Report

RACER 2002 Release

RACER 2002 was released in the latter part of March 2002. The following is a detailed list of enhancements, which were included in the release.

New Features within RACER 2002:

- Using Multiple RACER Database Files – Prior versions of RACER stored estimates in a single database file. RACER 2002 offered the capability to set up and use multiple database files to store estimates. The RACER interface enabled the user to easily switch from one database to another by navigating and selecting any valid RACER database file on computer or network.
- New Level 3 (Phase) – Operations and Maintenance – In prior versions of RACER, operations and maintenance costs could only be estimated within the Interim Action and Remedial Action phases. Additionally, operations and maintenance costs could only be estimated after capital construction costs for a remedial system had been estimated. Stand-alone operations and maintenance estimates in RACER 2002 were developed without first estimating capital construction costs.
- New Per Diem Functionality – Per Diem rates in RACER 2002 were calculated based on the location on the Level 1(Project) screen. Previous versions of RACER used a flat rate for the per diem value for every location in the RACER database. RACER 2002 uses the FY 2002 per diem rate corresponding to the specific location for the project being estimated.
- Additional Documentation on the RACER Installation CD – The USAF RACER Contingency Plan and Operating Procedures and the AFCESA Validation, Verification, and Accreditation (VV&A) Report were included within the support files folder on the RACER 2002 CD-ROM.
- Improved Project Import Option – The RACER 2002 project import screen size was increased for improved readability. In addition, new buttons were added that enable the user to select or deselect all projects in a folder.
- UXO Active Range Clearance – Three new technologies within the Active Range Clearance category, which address the costs related to cleaning UXO from ranges that are still in use, were added into RACER 2002. These technologies are:

- *Range Survey and Clearance Plan - estimates costs for the survey conducted prior to clearance activities, as well as costs for developing the clearance plan. This technology includes considerations for clearance scenario and site location.*
- *Active Range Clearance – estimates costs for clearing active ranges at each of seven predetermined ranges.*

- *Scrap Recovery and Disposal – estimates the quantity of scrap that remains on the range and determines the costs for recovery and disposal. Note: The Scrap Recovery and Disposal technology is designed for United States Air Force Users only.*

- *These new technologies provide the ability to estimate costs using three sets of unit price data: Military Cost (Ops Cost), Mil-Pay Cost, and Contractor Cost. Note: The Military Cost and Mil-Pay Cost data are available for authorized USAF users only. All other users are limited to Contractor costs.*

    - Residual Waste Management – Residual Waste Management is a new technology that was used to calculate costs for transporting and treating or disposing residual waste generated by other technologies in a phase. Adding Residual Waste Management as a new technology eliminated the need for a user to manually estimate costs.

    - New Documentation Technologies Available – Four new "Audit" Documentation technologies were added to RACER 2002. They are: Administrative Record, Five Year Review, Restoration Advisory Board, and Site Close-out Documentation. Use these technologies to ensure that costs for documentation have been captured in the estimate. Professional Labor and associated travel costs were included within the cost estimates for these technologies. Additionally, fieldwork costs for abandonment of wells was included within the Site Close-out technology, and long-term document storage costs were captured in the Administrative Record and Site Close-out technologies.

    - Fencing – The security option within the Fencing technology became functional within RACER 2002.

    - Parking Lots – Additional piping assemblies were added to the Parking Lots technology. Additionally, the interface was updated so that the default setting for inlet pipe is re-enforced concrete pipe.

    - Overhead Electrical Distribution – Two new assembly types were added to the Overhead Electrical Distribution technology within RACER 2002. They are the pull top switches and lightening arresters assemblies. Engineering logic and algorithms were updated per current engineering practices, including logic to allow for sag in an electrical line and grounding. Insulated conductors were also incorporated into the technology.

    - OE Site Characterization and Range Assessment – This technology was not a new technology in RACER 2002, but actually the modified and renamed version of the previous EE/CA technology. The RACER 2002 version of this technology included costs related to geophysical mapping. It also included built-in functionality to calculate costs based on total characterization. Additionally, the hours associated with various tasks were revised. If the user developed estimates using the EE/CA

technology in previous versions of RACER and wanted to update those estimates, this technology would need to be rerun. The algorithms changed significantly and must be re-run to make sure that the estimate is consistent with current engineering practice.

- User-Defined Estimate – The User Defined Estimate was updated in RACER 2002 so that when the safety level parameter changed, the assembly data would not be deleted. In earlier versions of RACER, when the safety level changed for a User Defined Estimate, all assemblies and costs were deleted. This change saved the user from having to re-enter data whenever safety levels changed. Additionally, when a User Defined Estimate was added or modified in RACER 2002, the user could enter a name for the UDE technology name, which made it easier to recognize on the screen and in the reports.
- Ordnance and Explosive Removal Action – The engineering logic and algorithms for the Ordnance & Explosive Removal Action technology were updated to be consistent with current UXO practices. This included adding DGN and differential GPS, as well as adding default densities based on the range type selected by the user and modifications to various tasks.
- Ex Situ Bioreactors – RACER 2002 passed the value for the flow rate entered within another technology to the default value for wet flow rate within the Ex Situ Bioreactors technology. This eliminated the need to re-enter flow rates from screen to screen.
- Monitoring – The Monitoring technology in RACER 2002 was made available within the studies phase.
- French Drain – This technology was updated to allow zero as a valid value for the minimum number of Product Holding Tanks. This technology was also updated to enable the user to accept the system definitions after a value was entered for the length of a transfer pipe.
- Groundwater Extraction Well – This technology was updated to allow decimal values rather than integer values for the flow rate per well value.
- Miscellaneous Field Installation – This technology was updated so the user can enter decimal values rather than integer values for the Percentage field on the System Definitions tab.
- Low Level Radioactive Soil Treatment – RACER 2002 offered a new, timesaving enhancement in the Low Level Radioactive Soil Treatment technology. The system definitions tab required the user to enter three separate parameters for volume, density, and quantity. When the values were entered into two of the three required parameters, the third parameter will be automatically calculated.
- Bulk Material Storage – An element dropdown list within the “Assembly Quantity and $” screen was no longer available for the Bulk Material

Storage technology since there were no valid options available for this technology.

- Other Technologies – Subsequent to the release of RACER 2001, other enhancements and fixes were implemented for several technologies. Changes to the Transportation and Slurry Walls technologies were carried over into RACER 2002. In addition, a new tools and engineering tips feature was added to the Demolition, Pipes technology.
- Update of Seven Existing RACER Technologies – The following seven existing RACER technologies were reviewed and the engineering logic and algorithms were updated for RACER 2002 to be consistent with current environmental practices: Contaminated Building Materials, Final Status Survey, Site Characterization Survey, Surface Documentation, UST Closure Removal (previously UST Closure), Drum Staging (previously Drum Removal), and Off Site Transportation and Waste Disposal.
- Level 1 (Project Screen) – The Level 1 Project screen was updated so the user may override the labor modifier for a selected location.
- Labor Templates – The "Save Template or Lose Information" warning was removed from RACER 2002 when a user is working with the labor templates and switching between hour and percent.
- Technology Markups – The Technology Markups form was changed to allow the user to enter zero for Prime Percent for situations where a subcontractor does all the work.
- Assembly Markups – The assembly markup feature within RACER was updated to recognize assemblies that should not be marked up.
- Updated Help Topics – New and improved help topics were added for the following technologies: Groundwater Monitoring Well, Permeable Barriers, Final Status Survey, Site Characterization Survey, Surface Decontamination, Contaminated Building Materials, Estimating Process, Using Multiple RACER Database Files, Changing to a Different RACER Database, RACER VV&A Status and Units of Measure.
- Reports – The layout of several RACER reports were altered to improve readability and printing, including a feature where all technology comments a user entered were printed as a report. Additionally, a new report for the Active Range Clearance technology was added to the report options in RACER 2002.
- Registration Routine – The registration routine for RACER 2002 was changed, so that RACER can be updated from versions one or two years prior. A new validation key was also required.